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9.	$\frac{2}{5}$	inertia period of	Jupiter and Saturn	4038.49
10.	$\frac{2}{3}$	" "	" Uranus	4060.86
11.	$\frac{2}{7}$	" "	Saturn and "	4046.08
12.	$\frac{1}{5}$	" "	" Neptune	4071.89
13.	$\frac{1}{12}$	" "	Uranus and "	4027.52
14.	Kirkwood's period			4043.43
15.	Mean			4070.48

If we substitute $\frac{14}{15}$ of Jupiter's year (4043.74) for the fifth number in the above table, the mean will become 4049.85, the time of planetary revolution at Jupiter's mean perihelion being 4057.65 days. The fractional coefficients of the exterior planetary years will also be nearly commensurable, $2 \times \frac{14}{15}$ being nearly equivalent to $5 \times \frac{3}{8}$, $14 \times \frac{2}{15}$, and $28 \times \frac{1}{15}$.

The relations of Uranus to the centre of oscillation of Neptune's radius vector and to the synchronous vibrations of light and gravity, lend interest to the following table. The elements introduced are the mean aphelia of the three outer planets, the mean perihelion of Jupiter, and the mean distances of the inner planets.

APPROXIMATE COMMENSURABILITY OF PLANETARY DISTANCES.

$\frac{2}{3}$ Neptune's mean aphelion	20.226
Uranus' " "	20.043
$2 \times$ Saturn's " "	20.
$4 \times$ Jupiter's mean perihelion	19.913
$13 \times$ Mars	19.808
$20 \times$ Earth	20.
$28 \times$ Venus	20.253
$52 \times$ Mercury	20.129
Average	20.046

The almost precise accordance of the general mean with the aphelion of Uranus, the diminution of values towards the centre, and the grouping by pairs, are all indicative of harmonic laws which may serve not only to explain the sun-spot cycles, but also many of the other phenomena of our system.

RELATIVE VELOCITIES OF LIGHT AND GRAVITY.

BY PLINY EARLE CHASE.

(*Read before the American Philosophical Society, March 7th*, 1873.)

The only approximate estimate of the velocity of gravity that has ever been made, appears to be that of La Place, who showed that it must be at least six million times as great as that of light. The mutual action and reaction of centrifugal and centripetal forces may, perhaps, furnish means for its ultimate satisfactory determination, to which end the following considerations may be regarded as preliminary.

I have already shown (*ante*, xii, 406) that the radiating force at the Sun's surface, is directly comparable with the gravitating force at the surfaces of the Earth and Jupiter. This fact has suggested a reference of balancing forces to the distance (δ) from the Sun's centre at which the luminous and gravitating velocities would be equal, similar to my previous reference of the gravitating forces of different masses, to the distance from a planetary centre at which satellite and orbital velocities would be equal.

If we take Norton's values of the astronomical elements, and suppose the Sun's mass concentrated in a single point,

$$\delta = \frac{425{,}061.5}{(183{,}454 \div 265.52)^2} = .89041 \text{ miles.}$$

The circumference in which gravity would give a uniform velocity equivalent to that of light, is, therefore, 5.5946 miles, and each circular oscillation would be performed in $\frac{5.5946}{183{,}454} = \frac{1}{32791}$ second. The time of solar rotation, (2,174,425 seconds) is equivalent to (2,174,425 $\times$ 32791 =) 71,301,570,175 primary gravity-oscilliations (β).

The number of centres of luminous undulations in any sphere is proportioned to $\pi^3 r$; if we divide $\pi^3\delta$ by β we obtain .0000245 in., which corresponds very closely with the wave length of the extreme red ray (.0000266).

Again, if we divide the time of solar rotation by $\pi \times$ the square of the time of a primary gravity-oscillation, we obtain

$$\left(2{,}174{,}425 \div \frac{\pi}{(32{,}791)^2} = \right) 744 \times 10^{12},$$

which corresponds nearly with the number of oscillations of the extreme violet ray in one second (727×10^{12}).

THE GAMUTS OF SOUND AND LIGHT.

By Pliny Earle Chase.

(*Read before the American Philosophical Society, March* 21, 1873.)

The evidences of planetary annuli of balancing forces may be still further supplemented by a comparison of the visible with the audible waves.

Various correspondences have been pointed out between the scale of color and musical scales, but Ponton has shown (Quarterly Journal of Science, No. XXXVII, pp. 91–103) that the agreement is not so close as has been sometimes supposed. There are, however, some interesting relations which seem to show an underlying harmonic law, which is partially obscured by want of homogeneity, either in the solar atmosphere, or in the æthereal medium, or in both.